Noteworthy *Sarracenia* Collections II

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Abstract

Two new green mutant *Sarracenia* species are reported for the southeastern United States, *S. leucophylla* Raf. and *S. minor* Walt. with both producing yellow flowers. A dominant/recessive relationship is suggested for wild-type reds (dominant) and mutant greens (recessive). Reports of putative orange-leaved or flowered intermediates between reds and greens are discussed and we suggest that these represent novel mutations instead of backcrosses.

Introduction

Since our previous article on noteworthy collections appeared (Sheridan and Scholl, 1993a) additional *Sarracenia* variants have been discovered which warrant publication. Our goal was, and remains, to continue field work to find and report new, unusual or interesting pitcher plants. We invite other workers to join us in this effort and publish their noteworthy collections. Many times we have heard of interesting collections from remote geographic areas or of new varieties which have not been backed up with a written record, map of location or, ultimately, a herbarium specimen.

Materials and Methods

Field searches were conducted by Bill Scholl and Jim Bockowski in southwestern Georgia and northern Florida for pitcher plant bogs and reptile habitats. Surveys were conducted along interstates, state highways and dirt roads. Suitable habitats for investigation were determined by floristic, hydrologic and topographic composition as well as reports from other workers.

Results

Two new *Sarracenia* variants were found:

S. leucophylla Raf. (green)

A single non-flowering specimen was discovered during August of 1993 in Baldwin County, Alabama by Bill Scholl and two separate plants were found in the same area by John Hummer and Carl Mazur in July of 1994. The identity of the Scholl specimen was confirmed as a green mutant in 1994 when the plant produced a yellow flower (Fig. 1). Self pollination of the flower resulted in all-green seedlings.

Seedlings of this noteworthy specimen are available from the second author. Inquire as to availability and prices.

S. minor Walt. (green)

Discovered by Jim Bockowski in the company of Bill Scholl in a burned long-leaf pine hillside seepage bog in southwestern Georgia in August of 1993 (Fig. 2). This clone has been rather anemic in its growth and the largest leaves are only 12cm. Flowers, leaves and growth point are pure green/yellow in full.

Discussion

We propose the following terminology regarding color varieties:

1. Green
2. Yellow-flowered
3. Red

Green is used in place of the term "anthocyanin-free" to refer to mutants without red pigmentation in leaves, flowers or growth point. Normally red-flowered species which have mutants that are yellow-flowered do not fall under the nomenclature of "green". For now they will simply be called "yellow-flowered mutants". "Red" will refer to plants that normally contain any red or purplish pigment in either leaves, flowers or growth point (e.g *S.flava* with red only at the growth point would fall under the designation "red"). Geneticists would refer to this phenotype as the wild-type. We acknowledge, however, that the differently pigmented phenotypes may deserve a more detailed genetic nomenclature in the future.

Although the term that has been used in the past, "anthocyanin-free", may be correct we use "green" for two reasons. First, additional biochemical work is necessary to determine whether "anthocyanin-free" is indeed accurate. Although paper chromatography work (McDaniel, 1966; Schnell, 1978) suggests that anthocyanin is the red pigment which is normally lacking in these mutants, an objective analysis should not rule more obscure possibilities such as betalins, phlobaphenes or red carotenoids. (Harborne, 1973; Robinson, 1980). Second, "green" is more concise than "anthocyanin-free".

Case (pers. comm. 1995) reports the discovery of a single green *S. leucophylla* with yellow flowers near Chatom, Alabama in 1962 while Bednar (in press) reports the discovery of green *S. minor*. Bednar (in press) also mentions *S. psittacina* variants which are pink or orange flowered as well as individuals with green leaves but red to maroon flowers. The second author has observed similar plants in western Florida. Don Schnell (pers. comm. 1994, 1995) also reports intermediate flower and leaf colors in *S. purpurea* in Michigan bogs where *S. purpurea* ssp. *purpurea* f. *heterophylla* grows as well as in North Carolina where *S. rubra* ssp. *jonesii* and its green mutant coexist . Case (1956) reported orange-red leaved plants of *S. purpurea* in Michigan and speculated (1972) that several genes were involved producing the orange phenotype in backcrosses between wild-type reds and greens.

Sheridan and Scholl (1993b) did not detect intermediates in Nova Scotia nor did Robinson (1981) in Connecticut. An alternate hypothesis to the blending of phenotypes (partial dominance) being responsible for orange and pink colored plants is Robinson's

suggestion that mutated genes are responsible for intermediate colors. Orange and pink flowered mutants are known to occur in other plants as a result of lesions in the anthocyanin metabolic pathway (Martin and Gerats, 1993). Thus several independent mutants may occur in the same bog and give the illusion of being hybrids between reds and greens. Some bogs may have several different mutants (green mutants, orange-flowered and yellow-flowered plants) while others have none because of random chance, genetic drift in small populations or other factors.

Sheridan (1994) determined that a dominant/recessive relationship exists in controlled crosses between reds and greens, not partial dominance as earlier workers suspected. In other words only red is expressed in leaves, flowers and growth point of the F_1 generation (offspring of crosses between reds and greens) not an intermediate color such as pink or orange. Seed collected from the original *S. rubra* ssp. *gulfensis* green growing in the wild which were raised to maturity resulted in a mix of red and green plants. The green plants were probably the result of self pollination and the reds were probably naturally outcrossed with wild-type plants as indicated by the dominant red flower color in these F_1 specimens (Fig. 3). Note that the flower is the red color typical of wild-type plants, not an intermediate color, suggesting a dominant/recessive relationship between reds and greens. Self pollination of these flowers resulted in red and green seedlings suggesting a dominant/recessive relationship. Anthocyanin is known to be controlled by a set of dominant genes and homozygous recessives (green plants) lack enzyme activity (Mulder-Krieger & Verpoorte, 1994) which would tend to support the conclusion that a dominant/recessive relationship exists in crosses between red and green pitcher plants. A manuscript with a more detailed explanation of these results and supporting data be reported in a future paper.

The dominant/recessive interaction of reds and greens is in contrast to and should not be confused with the presumed normal genetic behavior of blending (incomplete or partial dominance) of phenotypes observed in wild crosses in *Sarracenia* (e.g. the cross between *S. flava* and *S. purpurea* has intermediate colored flowers). Green mutants produce only red flowers in the F_1 generation when crossed with wild-type reds. A possible explanation is that these mutants, in addition to lacking red pigment, also are missing yellow pigments or controlling factors which are responsible for the blending seen in crosses in the field between red and yellow flowered species.

In summary, the following phenotypes have now been found or are reported in *Sarracenia* which may represent novel mutants, not hybrids.

1. Orange-leaved plants.

2. Orange-flowered plants.

3. Green-leaved plants with red flowers.
   (normally have red leaves)

4. Green leaves, flowers and growth point.
   Nomenclature: "green" (traditionally anthocyanin-free)

5. Red-leaved plants with yellow flowers.
   (normally red-flowered)
   Nomenclature: Yellow flowered mutant

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Figure 1. Flower and leaves produced in spring and fall 1994 of the *S. leucophylla* (green) mutant. Photos by Bill Scholl.

Figure 2. *S. minor* (green) in burned long leaf pine seepage wetland in southwestern Georgia, June 1994. Photo by Bill Scholl.

Figure 3. *S. rubra* ssp. *gulfensis* F_1 heterozygote. Red petals are deposited at FTG, #1469. Photo by Phil Sheridan.

Rediscovery of a Very "Rare" *Utricularia* in Brazil

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On my third trip to Cuiabá (Mato Grosso state, western Brazil) in February '94 to